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NEW DISEASE REPORT

Tulip virus X (TVX) associated with lemon balm (*Melissa officinalis*) variegation: first report of TVX in the USA

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Lemon balm (*Melissa officinalis*) has been grown for centuries as an ornamental and for its medicinal properties. One of the most popular clones shows bright variegation symptoms. Mechanical inoculations onto *Gomphrena globosa*, using variegated leaf tissue as the inoculum source, resulted in development of necrotic lesions about 5 days postinoculation, which suggested a viral aetiology of the variegation. Negatively stained leaf dips, examined with an electron microscope, revealed particles ≈500 × 13–14 nm in size. Double-stranded RNA was extracted from a variegated clone of *M. officinalis* and cloned as described elsewhere (Tzanetakis *et al*., 2005). Sequence data (GenBank Accession Nos AY842508–AY842510) revealed that the plant was infected with *Tulip virus X* (TVX). Oligonucleotide primers TVX 1F (5′-GACAYTCTAACCCCTTCGC-3′), TVX 1R (5′-GCCCTCTGTGGAAGTATCT-3′) and TVX 2F (5′-GAACAAGCACACCTCCACCA-3′), TVX 2R (5′-AGTGTGGTTTTCCCGGC-3′) were developed for detection of the virus, and were used in RT-PCR to test for TVX in four variegated clones of *M. officinalis* from Oregon and Washington, as well as *G. globosa* indicators with symptoms. The abovementioned plants all tested positive for TVX by RT-PCR, while noninoculated *G. globosa* or *M. officinalis* plants without symptoms were negative. The amplicons were sequenced, which confirmed their identity as TVX.

This is the first report of TVX in association with variegation in lemon balm and the first report of the presence of the virus in the USA.

Reference

Tzanetakis IE, Keller KE, Martin RR, 2005. The use of reverse transcriptase for efficient first- and second-strand cDNA synthesis from single- and double-stranded RNA templates. *Journal of Virological Methods* **124**, 73–7.

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